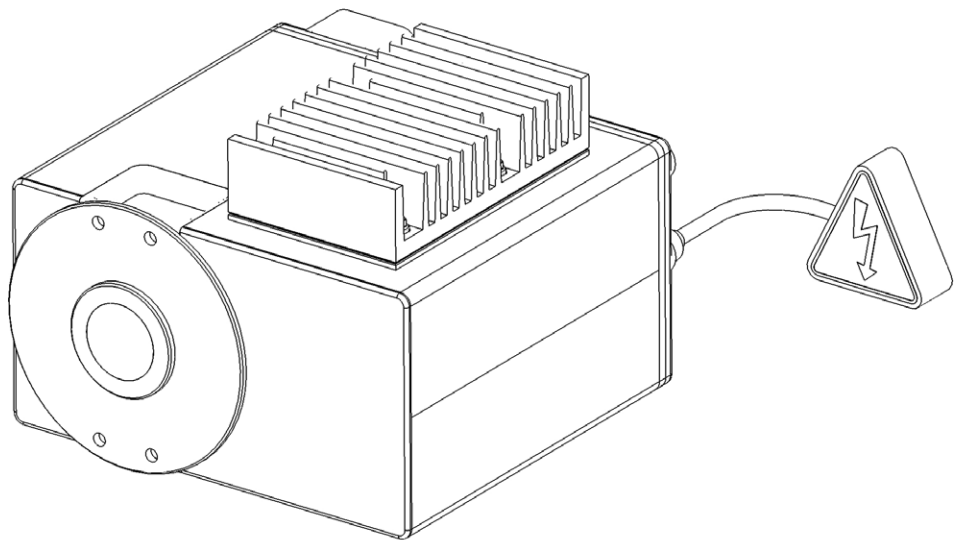# NIR-Online Multipoint System
Technical data sheet

NIR-Online®

NIR-Online Multipoint Sensors (MPS) are based on diode-array technology. Up to nine Multipoint Heads (MPH) may be attached to one Multipoint Sensor. The compact, robust instruments are equipped with a flange and sapphire lens. They can be directly mounted to a process vessel or tube. Additional accessories for solid and liquid products are available.

Description of Device

The Multipoint System consist of the Multipoint Sensor (MPS) and up to nine optional Multipoint Heads (MPH). The MPS itself represents a stand-alone measuring unit. In contrast, MPH may only be used in combination with an MPS. The Multipoint system is used to measure the relative absorbance of one to ten samples in the range of 900 to 1700nm. This is accomplished by using a tungsten halogen light-source both in the MPS and MPH rated at 5W, design calculation give a maximum induced energy of 2W over the window surface and a specification of <1mW/mm² over the measured surface (this is well below limit of 5mW/mm²).

The sample will selectively absorb light over the wavelength range depending on its color and chemical composition. The reflected signal is detected by a spectrophotometer in the MPS. The MPH does not contain a spectrophotometer. Thus, reflected light from a sample in front of an MPH is transferred via optical fiber from the MPH to the MPS' spectrophotometer. Up to nine MPH may be connected as a 3 x 3 array (figure 1) to the MPS yielding three parallel connected MPH and 3 daisy chains consisting of 3 MPH each.
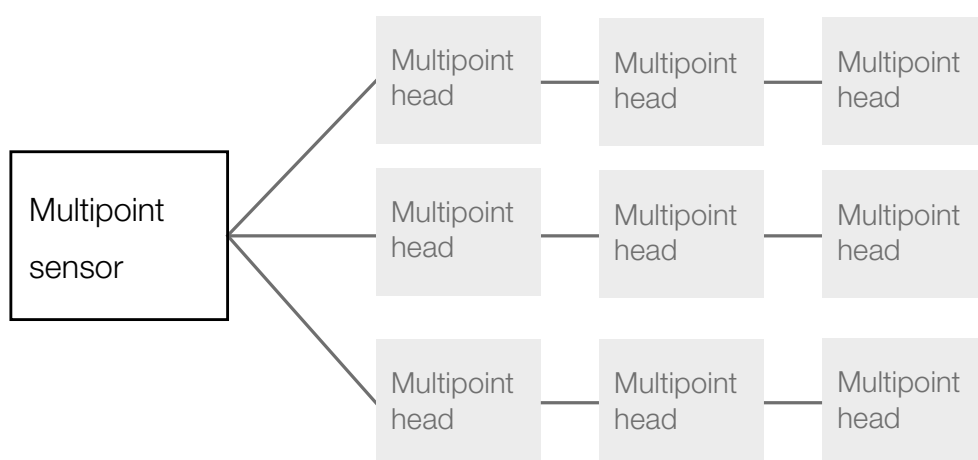

Figure 1: Simplified schematic representation of nine MPH connected to an MPS as 3x3 array.

The spectrophotometer inside the MPS consists of a diffraction grating dispersing the wavelengths along an axis where a series of InGaAs photo-detectors is used to determine the amount of energy per wavelength. This produced series of data points (vector) is passed through a galvanic isolated interface (RS422) to a PC. The PC passes this "vector" through a multivariate calibration model to "filter out" (predict) the desired measuring property e.g.: color, water content, protein content, fat content etc.

Scope of delivery

Available instrument configuration	NIR	Dual lamp	Measuring distance
Multipoint Sensor 11X1-6 Series	●	●	0 - 20 mm
Multipoint Head 11XH-Series	●	●	0 - 20 mm

System requirements

The PC must meet the following requirements:

Operating System	Windows 7 (32-bit or 64-bit) SP1 or Windows 10 (Windows 8 not supported)
Central Processing Unit	Intel Core i7
RAM	4 GB or more
Harddisk	80 GB free hard disk space. The hard drive needs to be extra durable, e.g. type: Seagate Series EE25.2
	Intranet or secondary hard disk for backup storage 0.5GB + 20MB/day/instrument
Display resolution	1280x1024 or higher
LAN	1 x 100 Mbit/s LAN or faster
USB 2.0 / 3.0	1 x USB per DataLab I/O box
PCI / PCIe	1 slot for profibus card (if profibus interface is selected)
Required software	Microsoft Word and Excel 2003 or higher

Minimum configuration

A minimum functional setup consists of one MPS, installation box, cable and PC with SX-Suite software. Additional hardware may be needed for accessories, or process control interfaces. Please contact your local BUCHI representative for further details.

Technical data

Dimensions (W x D x H)	Multipoint Sensor 235 x 230 x 180 mm Multipoint Head 150 x 230 x 130 mm
Weight	10.5 kg Multipoint Sensor 6.6 kg Multipoint Head
Max. operating pressure	30 bar at flange
Relative humidity	<90% non condensing
Ambient temperature	-10°C – 40°C
Product / flange temperature	-10°C – 70°C (130°C with X-Cell water cooling)
Vibrations	0.2 G at 0.1 – 150 Hz
Detector	Multipoint Sensor: diode array Multipoint Head: none
Spectral range*	900 – 1700 nm; 5900 - 11100 cm^{-1}

Measuring time	MPS diode array: 20 spectra/s
	MPH 1st layer: 1s
	MPH 2nd layer: 2 - 3s
	MPH 3rd layer: 4 - 9s
	approx. 22 - 40s for full turnaround of 9 MPH
Illumination spot diameter	30 - 40 mm, depending on accessory and optical setup
Multipoint Sensor and Multipoint Head	Tungsten halogen dual lamp / 18000 h (2 x 9000 h)
Electric power supply	110 or 220 VAC ± 20%, 50/60 Hz, 30 W
Housing materials	Stainless steel (nickel coated), aluminum cooler, FFKM (standard sealing material; custom sealing upon request)
System protection*	tbd
ATEX	tbd

* Availability depends on the selected instrument configuration

Software

All configurations of the instruments are operated by the SX-Suite, consisting of the following modules:

	Description	Typical usage	User	Occurrence
SX-Server	Instrument driver	Read out instrument status	Operator	As needed
		Setup of hardware	NIR-admin	On installation and maintenance
SX-Center	User interface	Choose product	Operator	Daily use (if not fully automated)
		View results (table, trend charts, reports)		
		Enter reference data		
SX-Backup	Data backup scheduler	Automated backup of measurement data, results and calibrations	NIR-admin	On setup

The following licenses activate different functionality of the SX-Suite. All versions of the SX-Suite are capable of measuring and analyzing NIR spectra.

License	Use case
Conveyor belt	Optimized for measurement of moving objects on a conveyor belt
Mix	Control end-point of mixing processes

Optional software

Software	Description	Typical usage	User	Occurrence
AutoCal	Automated calibration	If new reference data is available the calibration is updated and optimized automatically.	Operator (to enter reference data)	When calibration update is needed.
SX-Plus	Chemometric software	Manual build up or optimization of calibrations.	NIR-admin	When calibration update is needed.
SX-Profi	Profibus interface software	Configuration of profibus protocol (requires profibus card)	Process-control-system expert	On setup
SX-Client	Remote data visualizing	Display results or journal data for calibration purpose from a remote PC	Operator, NIR-admin	Daily use (if not fully automated)

Interfaces to computer

Interface	Hardware	Details
RS422	USB adapter	· Converts the instruments RS422 signal to USB COM port · Electrically isolated
Ethernet	USB adapter	· Converts the instruments RS422 signal to a virtual COM port via ethernet
Bluetooth	Bluetooth interface	· Wireless operation together with a battery pack (needs to be ordered separately).

Interfaces to Process Control System

Interface	Hardware	Details
Analog	Datalab, 4-20mA Interface	· Analog output of results · Alarm output · Heart-beat toggle for verification of interface · max. 4 parameter · 1 box per instrument
Profibus	Softing PB-IF-1MS or PB-IF-1S (+ SX-Profi software)	· Transmission counters to monitor function · Profibus and TCP/IP cannot be used at the same time · Needs SX-Profi software
RS422	Standard interface card	

Interface	Hardware	Details
TCP/IP	Standard ethernet card	· Transmission counters to monitor function · Profibus and TCP/IP cannot be used at the same time.

Accessories

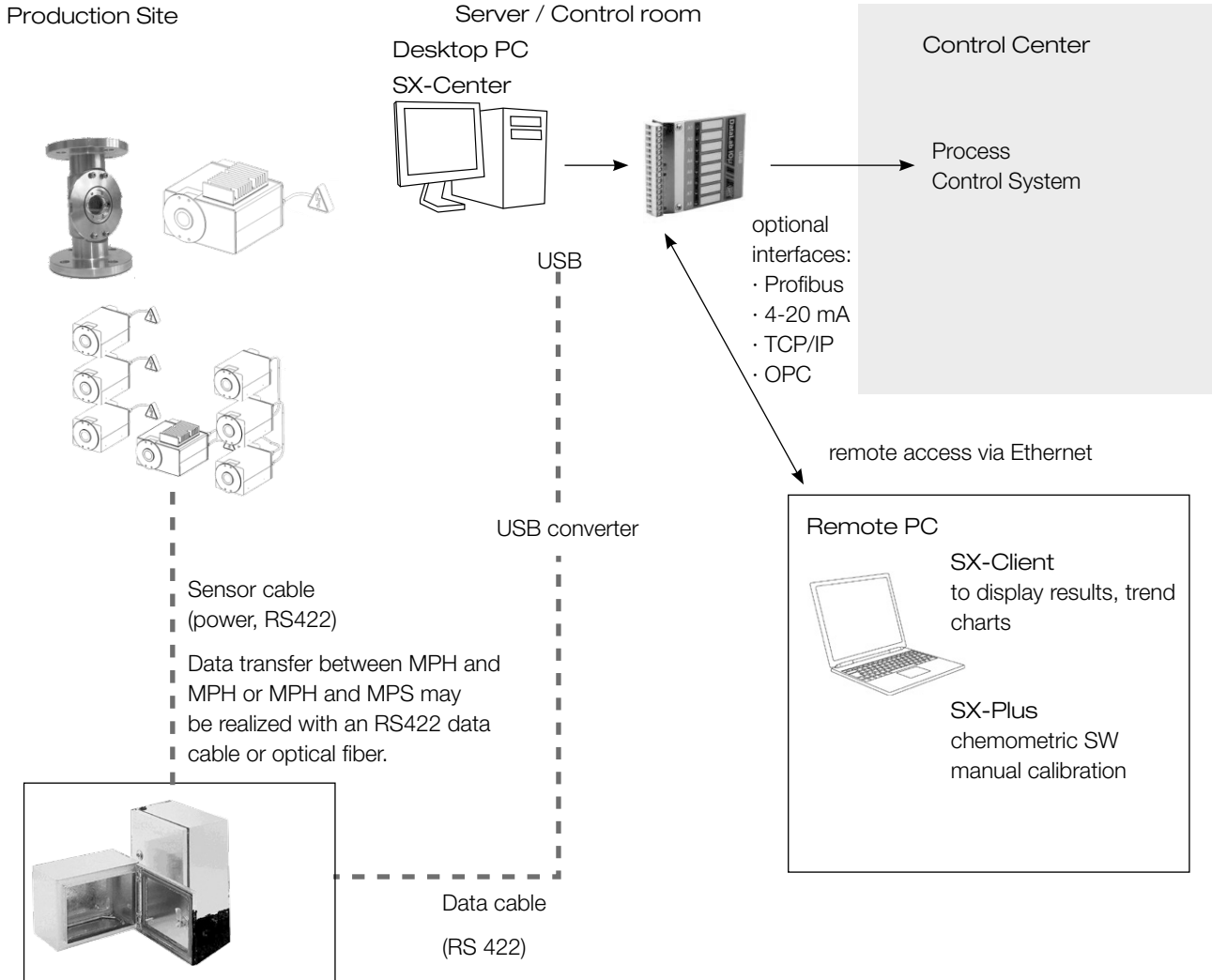| Articles	Details
Installation Box Standard	Supplies the instrument with power. Data cable to PC needs to ordered separately. · Steel housing 1.4301 / SST 304 · Dimensions: 300 x 167 x 300 mm (WDH) · ATEX II Ex 3D A 22 IP66 T100°C · Power supply · Instrument cable 10 m (32.8 ft)
Installation box bypass	Supplies the instrument and a feeder with power. Controls the pneumatic sampler. · ATEX II Ex 3D A 22 IP65 T100°C · Material 1.4301 / SST 304 · Dimensions: 380 x 217 x 380 mm (WDH) · Power supply, relays and DIN rail included · Instrument, motor and valve-control cable 10 m (32.8 ft) · Requires data cable, DataLab device and cable
Optical fiberw	· Mono fiber LIR 600/660 with metallic shield AS-E4 · SMA 905 connectors

Mounting accessories

The MPS or MPH flange can be directly mounted to a tube or reactor. Depending on the specific setup additional mounting accessory might be needed for implementation into the production facility.

Weld-in mounting plate For instrument in direct contact with the product	Plate with opening, fitting to instrument flange. · Dimensions: 160 x 241 x 3 mm · Material: 1.4301 / SST304 · Thread bolts M6
X-Square For all free flowing powders and granulates	The cell can be inserted in the product stream or bypass · Inspection panel (Plexiglas) · Adapted for Jacob pipes Ø150 mm · Stainless steel 1.4301 electro polished

Bypass sampler For free flowing goods (mealy / grainy)	Bypass with feeder and sampling point · Pneumatic sampler (min. 5 bar / 72.5 psi water or oil free compressed air DIN ISO 8573 Class 1) · Screw-conveyor (feeding capacity 1.5 t/h) · Motor (380V/50Hz ATEX A22 0.25 KW) · ATEX magnetic coil 12 V · Requires bypass-installation box and a DataLab IO device
Weld-in flange Provides the ability to remove instrument while keeping the process sealed	Flange with sapphire window and purge port for welding. · Adapter plate, ø140/106 mm, for wall thickness up to 8,5 mm · Stainless steel DIN 1.4404 (SST316Ti) · Purge port M5 (ø4mm tube adapter provided) to prevent condensation or detect leakage · High grade sapphire crystal optical lens, polished for reduced adhesion · Sealing material FFKM White G74S, FDA compliant 15°C (+59°F) to 260°C (+500°F) · Operating pressure -0.5 to 30 bar, peak pressure 100 bar max. · Dead volume max. 60 mm³
Varinline DN50 adapter For opaque products like powder or granules	In combination with a path length adapter also for transparent liquid, gel or pasty products. · Material 1.4404 (SST316L), C max.0,03% · Operating pressure up to 10 bar · Build for DN50 DIN 32676 · Sealing material FEPM Viton extreme, FDA compliant · Product temp. -14 °C(+5 °F) to 230 °C (+446 °F) · Path length adapter, pressure test with TÜV certificate upon request
X-Cell For gas, liquid and paste-like products	The cell can be inserted in the product stream or bypass · Material 1.4404 (SST316L), C max.0,03 % · Operating pressure up to 10 bar (145 psi) · Measurement slit 26 mm, configurable between 1 and 15 mm with additional adapter · DN 50 flange (other sizes upon request) · Clearance volume max. 120 mm³ Cells can be customized with different diameter and flanges.
Path length adapter To measure transparent liquids with the X-Cell	The reflector reduces the length of the optical path · Material 1.4404 (SST316L) C max 0.03 % · Gap 1 / 2 / 5 / 10 / 15 mm available
Air nozzle To improve instrument cooling	Reduces dust deposit on cooling fins and increases heat exchange of the instrument cooler · Fits for all instruments · N_2 or air DIN ISO 8573 Class1, min. 1 bar continuously · Connections for 8/6 mm hose (without hose) · Cooling power performance unspecified
Water chiller For maximum cooling	If product is warmer than 40 °C, additional cooling with the chiller may be needed. · Can be used with all instruments, only in combination with X-cell and weld-in flange. · Product temperature over 40 °C to 130 °C, for a product temperature of 130 °C at least a flow of 5 l/h @20 °C is needed. · 40 °C Over temp switch for external alarm purpose, NO (Normally open) circuit · Water connectors for 8/6 mm hose (without hose)

Functional principle

One MPS is mounted to the first measurement point. Up to nine MPH may be connected to one MPS. The installation box provides electrical power and connects the instrument with a PC. The PC is running the SX-Suite and calculates the results. These are shown as numbers and trend charts. Optionally the results can be transferred to a process control system or remote PC.

Production Site

Server / Control room

Desktop PC
SX-Center

Control Center

Process
Control System

USB

optional
interfaces:
· Profibus
· 4-20 mA
· TCP/IP
· OPC

remote access via Ethernet

USB converter

Remote PC

SX-Client
to display results, trend charts

SX-Plus
chemometric SW
manual calibration

Sensor cable
(power, RS422)

Data transfer between MPH and MPH or MPH and MPS may be realized with an RS422 data cable or optical fiber.

Data cable

(RS 422)

Installation box with Power Supply

One power supply supports 1 MPS + 3x3 MPH array. Usually 1 installation box is required per MPS and MPH. However, individual connection with multiple installation boxes is possible.

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